

## **REMARKS/ARGUMENTS**

Claims 1-16 are pending. Claims 1-16 have been rejected. Claim 4 has also been objected to because of a formality. Claims 1-8, 11, 12 and 14 have been amended. New Claims 17-22 have been added. Support for the amended and new Claims are as follows:

<u>Claim</u>	<u>Support</u>
1	page 4, lines 18-20
2	page 4, line 20
3	page 4, line 22; page 8, line 34 and page 9, line 5
5	page 2, lines 13 and 14
6	page 5, lines 28-34
7	page 2, lines 13 and 14; page 4 lines 31 and 32; and page 5, lines 1-3
8	merely changes Claim dependency; original Claim 8
11	page 6, line 31 and 32
12	page 6, lines 31 and 32
14	page 4, lines 18-20 and page 6, lines 31 and 32
17	page 2, lines 32 and 33
18	page 2, lines 33-35
19	page 4, lines 5-9
20	page 4, lines 9-12
21	original Claims 1 and 6 and page 4, lines 18-20
22	original Claim 7

### **Claim 4 Objection:**

The Office Action indicates that Claim 4 should be changed to read to – transition metal compound other than titanium --. Claim 4 has been amended as suggested by the Examiner.

### **The §112, second paragraph, Rejection:**

Claims 8-16 have been rejected for being indefinite because Claim 8 recites, “an organoaluminum halide, and organoboronhalide, or a mixture thereof,”

which was deemed to be confusing apparently because of the unnecessary “and” rendering the Markush group indefinite. Amended Claim 8 deletes the unnecessary “and”, making amended Claim 8 and claims dependent therefrom definite.

**The §102(e) Rejection:**

Claims 1-11 and 14-16 have been rejected under 35 U.S.C. §102(e) as being anticipated by Wagner et al., U.S. Pat. No. 6,982,237 (“Wagner” herein).

*Amended Claim 1 and new Claim 21:*

In summary, the Office Action appears to be arguing that original independent Claims 1 and 4, 8 and 14 and dependent Claim 11 are anticipated by Wagner’s claims 1, 3, 7, 8 and 15, 21-24. In particular, the Office Action states that “the transition metal compound can be a combination of a titanium compound and a hafnium compound,” which appears to be referring to Claim 15 of Wagner and applicable to original dependent Claim 11. Claim 15, however, merely lists multiple metals in which any one individually or in combination with any or all the others may be used. Thus, Applicants disagree that Ti in combination with Hf is anticipated as claimed in Claim 11. Nevertheless, Applicants have amended the independent claims and respond as follows.

As amended, Claim 1 now requires that the “non-metallocene compound of a transition metal other than titanium comprises a hafnium compound and the molar ratio of the titanium compound to hafnium compound is from 100/1 to 1/20.” As stated above, merely because Wagner describes that the compound may be selected from a list of metals including titanium and hafnium is insufficient to anticipate original Claim 1. The particular combination must be unambiguously described. Even so, Claim 1 has also been amended to include the ratio of the titanium compound and hafnium compound. For these two reasons, Claim 1 is novel over Wagner. Claim 1 is also non-obvious, since Wagner gives no indication as to what if any ratio would be useful. In addition, Applicants have discovered that by the use of the particular combination of Ti/Hf compound, unexpectedly the polymer is able to develop a high molecular weight component intimately dispersed within the

polymer adding useful properties such as much greater stiffness while still enabling ease of processing. Thus, amended Claim 1 and Claims dependent therefrom are novel and non-obvious.

*Amended Claim 4:*

Amended Claim 4 now requires that the primary diluent is an organic compound containing hydroxyl functionality. Thus, Claim 4 requires that the Mg, Ti and other non-metallocene compound is spray dried from a solution containing a large excess of hydroxyl functionality such as, from ethanol shown at page 10, lines 15-20 of the specification.

In contrast, Wagner, specifically teaches that the spray drying is done in a solvent that is provided in large excess with respect to the coordination environment for magnesium. (col. 7, lines 5-8) The solvent is an ether, ketone, or ester. (col. 6, lines 11 and 12). In Wagner, a hydroxyl containing compound referred to as an electron donor compound is also employed, such as an alcohol, but it is used in small quantities such that the molar ratio is less than or equal to 1.9. (col. 5, lines 17-20 and 63-67) The solvent, such as an ether, also has electron donor characteristics, but are arbitrarily defined as not being an electron donor compound. (col. 6, lines 11-17). From this it is clear that the solvent and electron donor compound are analogous to the primary diluent of the present case. Since the primary diluent of Claim 4 contains hydroxyl functionality, Claim 4 is novel over Wagner because Wagner specifically describes that such diluents (i.e., electron donors having hydroxyl functionality such as an alcohol) are limited to a very small amount to ensure the coordination environment of the Mg along with the presence of a large excess of solvent (diluent that is, for example, an ether), so as to ensure that the valence state of the metals are created and maintained such that active catalyst of the proper metal valence is formed. Thus, Claim 4, which requires exactly the opposite (i.e., large excess of hydroxyl containing functionality solvent/electron donor, i.e., the primary diluent) of that taught by Wagner, is novel and for the same reason non-obvious.

**The §103(a) Rejection (Jorgenson in view of Masi):**

Claims 1-5 and 8-16 have been rejected under 35 U.S.C. §103(a) as being obvious over Jorgensen et al., U.S. Pat. No. 5,290,745 (Jorgensen) in view of Masi et al., EP0449355 (Masi).

The Office Action states that, “[t]he difference between the present claims and the disclosure of Masi [*sic*] et al. is the requirement of a non-metallocene compound of a transition metal other than titanium.” Applicants believe the Office Action meant to say “Jorgensen et al.” instead of “Masi et al.” The Office Action then goes on to argue that Masi et al. “disclose a supported catalyst for olefin polymerization in the presence of a catalyst comprising (a) an organometallic compound of aluminum and (B) a second component obtained by bringing [*sic*] a magnesium compound, a titanium compound, and a hafnium compound with a porous support, wherein the molar ratio of Mg/Ti/Hf is 2/1/1.5.”

*Amended Claim 1:*

The Office Action recognizes that the Masi catalyst requires impregnating into a *porous support*. The Masi support is an integral aspect of the catalyst of the invention in that the aerogels that make up the support that are “distinguished by low density, high porosity and the fact that at least 90% of their pores have a diameter with a very narrow range of values . . . the minimum value and maximum value never exceeding 5 nm.” (page 2, lines 10 and 11 and Claim 1). Thus, even if one were to use the catalyst of Masi in Jorgensen, it would not read upon the catalyst of Claim 1, because Claim 1 requires that the catalyst is a spray dried catalyst, whereas the catalyst of Masi is not. Consequently, the Office Action has failed to make a *prima facie* case of obviousness. For this reason Claim 1 is non-obvious.

Further, Jorgensen specifically teaches that there are fundamental differences between spray dried and impregnated supported catalysts, for example, constrained drying in the supported catalyst versus unconstrained drying. (col. 3, lines 65-68 and col. 4, lines 1-10) Jorgensen also describes that the catalyst is made in the

absence of radicals containing active hydrogen such as alcohol radicals. (col. 2, lines 58-64) Finally, Jorgensen describes that there are fundamental differences in achieving the necessary valence states for productive useful catalysts even for their simple single Ti transition metal compound catalysts. (col. 3, lines 65-68 and col. 4, lines 1-10). From this, it is clear that one of ordinary skill in the art would not use such a catalyst in Jorgensen, because Jorgensen specifically teaches that alcohols are to be avoided in their catalysts and certainly does not suggest or give any expectation that spray dried catalysts other than the single Ti compound catalysts would be operative at all in view of the differences between supported impregnated catalysts and spray dried catalysts. For this additional reason Claim 1 is non-obvious.

*Amended Claim 4:*

To reiterate, amended Claim 4 now requires that the primary diluent is an organic compound containing hydroxyl functionality. Thus, Claim 4 requires that the Mg, Ti and other non-metallocene compound is spray dried from a solution containing hydroxyl functionality such as ethanol described at page 10, lines 15-20 of the specification.

In contrast, Jorgensen, specifically teaches that the electron donor solvent “must be free of radicals containing active hydrogen, such as alcohol radicals . . . . (col. 2, lines 47-63) Jorgensen, thus, clearly teaches that electron donor solvents such as alcohols are to be avoided. Masi describes a large excess of hydrocarbon solvent and about molar equivalents of alcohol with the catalyst for impregnating into a particular porous support that is fundamentally different than spray drying as detailed above. From this, amended Claim 4, which requires a primary diluent that contains hydroxyl functionality, is surprising in view of Jorgensen specifically teaching away from this. Further, it is surprising, even in view of Masi, because Masi only teaches impregnating into a particular porous support and even in this very different catalyst system, hydroxyl containing electron donor solvents are used sparingly. (All of the examples) For this reason, amended Claim 4 is non-obvious over Jorgensen in view of Masi.

**The §103(a) Rejection (Hwu in view of Masi):**

Claims 1-5 and 8-11 and 14-16 have been rejected under 35 U.S.C. §103(a) as being obvious over Hwu et al., EP0783007 (Hwu) in view of Masi.

The portion of Hwu (page 3, lines 10-16 and 34-58; page 4, lines 1-5) used in the Office Action in its rejection, describes spray dried catalysts briefly, but specifically states, “[t]his is described in United States patent 5,290,745,” which is Jorgensen. (page 3, line 21) In addition, U.S. Pat. No. 4,302, 565 (abstract) is cited, but this is specifically directed to impregnated catalysts in a similar manner as Masi. (page 3, lines 17 and 18). Thus, it is clear that the spray dried catalysts that Hwu refers to are those taught by Jorgensen and as such Hwu adds nothing more than Jorgensen, and amended Claims 1 and 4 are non-obvious over Hwu in view of Masi for the same reasons as described above for Jorgensen in view of Masi.

**Patentability of New Claim 21:**

New Claim 21 incorporates all the limitations of amended Claim 1 and original Claim 6. Thus, new Claim 21 is novel over Wagner for the same reasons that amended Claim 1 is novel. New Claim 21 is non-obvious over Jorgensen in view of Masi and Hwu in view of Masi, because original Claim 6 was not rejected for obviousness over these.

Considering the foregoing reasons and amendments, Claims 1-22 and are patentable. Applicants, therefore, respectfully request withdrawal of all rejections and allowance of Claims 1-22.

Respectfully submitted,

/Kevin J. Nilsen/  
Kevin J. Nilsen  
Registration No. 41,510  
Phone: 989-638-6505

P. O. Box 1967  
Midland, MI 48641-1967  
KJN/caa